

Clinical review

Regular review

Effective physiotherapy

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BMJ 2001;323:788-90

Publication of randomised trials and systematic reviews in physiotherapy has increased spectacularly over the past few years. There are more than 2700 randomised trials and systematic reviews in physiotherapy, of which more than 800 have been published since 1997.¹ The evidence from the best of these trials confirms the value of some current physiotherapy practices and the ineffectiveness of others. Some little used interventions have been found to be remarkably beneficial. This article describes some advances in our understanding of physiotherapy that have arisen from recent clinical trials.

Methods

With the help of several organisations and many volunteers, we have produced a web based database of randomised trials and systematic reviews in physiotherapy (PEDro).¹ Trials on the database are rated for methodological quality by using a modification of the Delphi list.² To produce this article, we scanned the database looking for recent systematic reviews or high quality clinical trials with clear conclusions and with potential to improve quality of life. We present selected findings of these trials and reviews.

Chronic musculoskeletal pain

Musculoskeletal disorders are the most common cause of chronic incapacity in industrialised countries.³ Fortunately, some of the most important advances in physiotherapy have been in the management of these problems, particularly chronic low back pain, osteoarthritis of the hip and knee, and rheumatoid arthritis.



Isometric exercise for back extensor muscles: exercise can reduce disability associated with chronic low back pain

Summary points

Early provision of reassurance and advice to return to activity can prevent chronic disability associated with back pain

Massage and electrotherapy are not useful for chronic pain, but exercise programmes can reduce disability

Women with urinary incontinence can be helped with pelvic floor muscle training

Multidisciplinary stroke rehabilitation programmes reduce the risk of disability and death and institutionalised care or dependency

Prophylactic chest physiotherapy reduces postoperative complications in high risk patients

Pulmonary rehabilitation programmes for people with asthma and chronic obstructive pulmonary disease reduce dyspnoea and increase walking distance

Tailored exercise programmes reduce the risk of falls in elderly people

There is strong evidence from recent studies that simple interventions provided soon after onset of symptoms can prevent the development of chronic back pain. For example, reassuring patients about the self limiting nature of most low back pain and advice to return to normal activity as soon as possible increases the rate of return to work for workers with low back pain.⁴ On the other hand, encouraging rest is probably harmful.^{4,5}

Traditionally, the mainstays of physiotherapy management of musculoskeletal pain have been massage, manual therapy (that is, manipulation and joint mobilisation), electrotherapy (such as therapeutic ultrasound, shortwave diathermy, and low energy laser), and therapeutic exercise. Current evidence paints a mixed picture of the effects of these interventions. There has been little rigorous research into the effects of massage,⁶ so the clinical benefits of massage, if any, remain unsubstantiated. Manual therapy is more effective than placebo in relieving low back pain, but it is not



Constraint of unaffected upper limb can improve motor function after stroke

clear if it is more effective than other physiotherapy treatments.⁷ Most electrotherapies probably have little more than placebo effects.⁸

The most positive findings come from recent studies of therapeutic exercise. Many trials and several systematic reviews have shown that exercise can produce clinically worthwhile reductions in the disability and handicap associated with chronic low back pain, osteoarthritis of the hip and knee, and rheumatoid arthritis.^{7 9 10}

The exercise programmes most often shown to be effective in contemporary clinical trials differ from traditional exercise in two important ways. Firstly, formal exercise programmes are considered to be part of a more global process of "activity prescription" involving a structured return to normal home, work, and social activities. Secondly, the programmes are based on evidence from behavioural sciences as well as the biological sciences. Many exercise programmes now explicitly incorporate principles of cognitive-behavioural therapy.¹¹ With this approach, patients are taught to exercise to quotas rather than as symptoms permit, specific rewards are provided when exercise quotas or activity goals are met, and pain behaviours are not rewarded by attention from the therapist.

Urinary incontinence

About a quarter of women experience involuntary loss of urine, and about 2.5% report this causes much bother or a great problem.¹² The problem of urinary incontinence in women, including genuine stress urinary incontinence, can be treated effectively with training of the pelvic floor muscles.¹³ For example, training pelvic floor muscles with weighted vaginal cones (weights inserted into the vagina) substantially increases the probability of cure or improvement compared with no exercise.¹⁴ An important recent trial of the effects of training pelvic floor muscles in women with genuine stress urinary incontinence has shown that doing eight near maximal pelvic floor muscle contractions three times a day for six months produces large reductions in the risk of incontinence related problems with social life, sex life, and physical activity.¹⁵ In this sample (mean duration of symptoms 10 years), absolute reductions in risk of each of these problems exceeded 35%, implying that at least a third of women experience each of these benefits from exercise. It is

not clear if training with weighted cones, biofeedback (electromyographic feedback of pelvic floor muscle activity) or electrical stimulation produces better outcomes than pelvic floor muscle training alone.^{13 15}

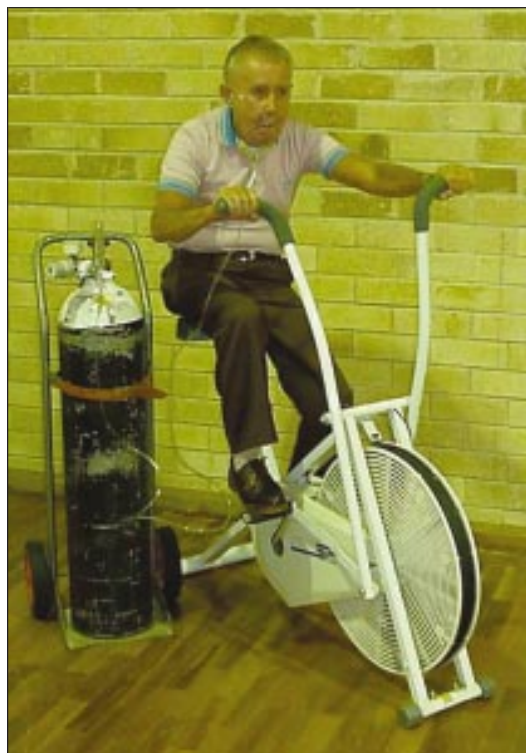
Movement dysfunction resulting from stroke

In terms of disability adjusted life years, stroke ranks as the sixth highest cause of burden of disease worldwide and is the single most important cause of severe disability in people living in their own homes.¹⁶ Multidisciplinary rehabilitation programmes reduce the odds of death or institutionalised care and the odds of death or dependency after stroke (odds ratios of 0.76 and 0.75), probably partly by reducing physical disability.¹⁷ There is some evidence that physical training reduces disability, and that more training produces better outcomes.^{18 19} Some specific methods of training show promise, although the evidence relating to these methods is limited to a few high quality trials. One simple strategy is to constrain the unaffected upper limb to "force" use of the affected upper limb.²⁰ Another effective strategy is to suspend patients in a harness above a treadmill to enable them to practice walking with partial body weight support.²¹

Acute and chronic respiratory disease

The role of physiotherapy in prevention and management of pulmonary disease has been debated for decades. Several recent important systematic reviews and clinical trials have helped clarify the situation.

Prophylactic chest physiotherapy before and after surgery reduces morbidity after major abdominal sur-



Pulmonary rehabilitation can increase quality of life for people with asthma and chronic obstructive pulmonary disease

Additional educational resources

PEDro—database of systematic reviews and quality assessed randomised trials in physiotherapy (<http://ptwww.cchs.usyd.edu.au/pedro>)
 Critically appraised papers in *Australian Journal of Physiotherapy*—structured abstracts and brief expert commentaries of key clinical research in physiotherapy (http://www.physiotherapy.asn.au/mediaandpubs/AJP/journal_of_physiotherapy.htm)
 Muscular disorders—spinal. *Physiotherapy Effectiveness Bulletin 1 (4)* London: Chartered Society of Physiotherapy

gery.²² For example, Olsen showed that prophylactic chest physiotherapy reduced the incidence of pulmonary complications after major abdominal surgery from 27% to 6%.²² This implies that, on average, one pulmonary complication is prevented for every five patients treated. It is not clear which interventions are most effective. Prophylactic chest physiotherapy has little effect when routinely administered after coronary artery bypass surgery or minor abdominal surgery, or during intubation after routine cardiac surgery.²³ This is consistent with the view that prophylactic chest physiotherapy is of most benefit to patients at the high-risk of postoperative complications.²²

Pulmonary rehabilitation programmes typically involve upper and lower body exercise (usually treadmill walking or stationary cycling), and may include ventilatory muscle training, counselling, and education. Such pulmonary rehabilitation programmes can increase walking distance and health related quality of life in people with asthma and chronic obstructive pulmonary disease.²⁴ A recent trial indicates that rehabilitation may also reduce duration of hospital stay but not the number of medical consultations.²⁵

An important and relatively new intervention is the application of nocturnal ventilatory support to patients with sleep disordered breathing, particularly patients with chronic obstructive pulmonary disease, neuromuscular diseases or injury, or cystic fibrosis. Nocturnal assisted ventilation greatly reduces one year mortality and hypoventilation related symptoms in people with neuromuscular diseases.²⁶

Prevention of falls in elderly people

One in three older people fall at least once a year.²⁷ There is strong evidence that multifaceted interventions targeting identified risk factors reduce falls risk in older people.²⁸ Well designed studies suggest that it is necessary to prescribe such interventions for about eight people to prevent one fall per year in a community setting.²⁹

Known risk factors for falls such as weakness of lower limb muscles and poor balance are potentially modifiable by exercise, so physiotherapists and others have provided exercise programmes for older people at risk of falling. Several trials and reviews conclude that exercise can reduce risk of falls.²⁸⁻³⁰ One individually tailored home based strength and balance training prescribed by trained health professionals has been found effective in four trials.³¹

We acknowledge helpful discussions with Elizabeth Ellis, Mark Elkins and Pauline Chiarelli. The Centre for Evidence-Based

Physiotherapy is funded by the Motor Accidents Authority of New South Wales and the New South Wales Physiotherapists Registration Board.

Competing interests: None declared.

- 1 Centre for Evidence-Based Physiotherapy. PEDro (Physiotherapy Evidence Database). <http://ptwww.cchs.usyd.edu.au/pedro> (accessed May 14, 2001).
- 2 Verhagen AP, de Vet HC, de Bie RA, Kessels AG, Boers M, Bouter LM, et al. The Delphi list: a criteria list for quality assessment of randomized clinical trials for conducting systematic reviews developed by Delphi consensus. *J Clin Epidemiol* 1998;51:1235-41.
- 3 Clinical Standards Advisory Group. Epidemiology review: the epidemiology and cost of back pain. (Annex.) *Clinical Standards Advisory Group Report on Back Pain*. London: HMSO, 1994.
- 4 Waddell G, Feder G, Lewis M. Systematic reviews of bed rest and advice to stay active for acute low back pain. *Br J Gen Pract* 1997;47:647-52.
- 5 Hagen KB, Hilde G, Jamvedt G, Winnem M. Bed rest for acute low back pain and sciatica. *Cochrane Database Syst Rev* 2001;(3):CD001254.
- 6 Furlan AD, Brosseau L, Welch V, Wong J. Massage for low back pain. *Cochrane Database Syst Rev* 2000;(4):CD001929.
- 7 Van Tulder MW, Koes BW, Bouter LM. Conservative treatment of acute and chronic nonspecific low back pain: A systematic review of randomized controlled trials of the most common interventions. *Spine* 1997;18:2128-56.
- 8 Feine JS, Lund JP. An assessment of the efficacy of physical therapy and physical modalities for the control of chronic musculoskeletal pain. *Pain* 1997;71:5-23.
- 9 Van Baar ME, Assendelft WJ, Dekker J, Oostendorp RA, Bijlsma JW. Effectiveness of exercise therapy in patients with osteoarthritis of the hip or knee: a systematic review of randomized clinical trials. *Arthr Rheum* 1999;42:1361-9.
- 10 Van den Ende CHM, Vlieland TPM, Munneke M, Hazes JMW. Dynamic exercise therapy for rheumatoid arthritis. *Cochrane Database Syst Rev* 2001;(3):CD000322.
- 11 Klaber Moffett J, Torgerson D, Bell-Syer S, Jackson D, Llewellyn-Phillips H, Farrin A, et al. Randomised controlled trial of exercise for low back pain: clinical outcomes, costs and preferences. *BMJ* 1999;319:279-83.
- 12 Hannestad YS, Rortveit G, Sandvik H, Hunskaar S. A community-based epidemiological survey of female urinary incontinence: the Norwegian EPICONT study. *J Clin Epidemiol* 2000;53:1150-7.
- 13 Hay-Smith EJC, Bø K, Berghmans LCM, Hendriks HJM, de Bie RA, van Waalwijk van Doorn ESC. Pelvic floor muscle training for urinary incontinence in women. *Cochrane Database Syst Rev* 2001;(3):CD001407.
- 14 Herbison P, Plevnik S, Mantle J. Weighted vaginal cones for urinary incontinence. In: *Cochrane Database Syst Rev* 2001;(3):CD002114.
- 15 Bø K, Talseth T, Vinsnes A. Randomized controlled trial on the effect of pelvic floor muscle training on quality of life and sexual problems in genuine stress incontinent women. *Acta Obstet Gynecol Scand* 2000;79:598-603.
- 16 Murray CJL, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. *Lancet* 1997;349:1436-42.
- 17 Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database Syst Rev* 2001;(3):CD000197.
- 18 Kwakkel G, Wagenaar RC, Koelman TW, Lankhorst GJ, Koetsier JC. Effects of intensity of rehabilitation after stroke: A research synthesis. *Stroke* 1997;28:1550-6.
- 19 Kwakkel G, Wagenaar RC, Twisk JWR, Lankhorst GJ, Koetsier JC. Intensity of leg and arm training after primary middle-cerebral-artery stroke: a randomised trial. *Lancet* 1999;354:191-6.
- 20 Dromerick AW, Edwards DF, Hahn M. Does the application of constraint-induced movement therapy during acute rehabilitation reduce arm impairment after ischemic stroke? *Stroke* 2000;31:2984-8.
- 21 Visintin M, Barbeau H, Korner-Bitensky N, Mayo NE. A new approach to retrain gait in stroke patients through body weight support and treadmill stimulation. *Stroke* 1998;29:1122-8.
- 22 Olsen MF, Hahn I, Nordgren S, Lonroth H, Lundholm K. Randomised controlled trial of prophylactic chest physiotherapy in major abdominal surgery. *Br J Surg* 1997;84:1535-8.
- 23 Patman S, Sanderson D, Blackmore M. Physiotherapy following cardiac surgery: is it necessary during the intubation period? *Austral J Physiother* 2001;47:7-16.
- 24 Cambach W, Wagenaar RC, Koelman TW, van Keimpema AR, Kemper HC. The long-term effects of pulmonary rehabilitation in patients with asthma and chronic obstructive pulmonary disease: a research synthesis. *Arch Phys Med Rehab* 1999;80:103-11.
- 25 Griffiths TL, Burr ML, Campbell IA, Lewis-Jenkins V, Mullins J, Shiels K, et al. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. *Lancet* 2000;355:362-8.
- 26 Annane D, Chevret JC, Chevret S, Raphael JC. Nocturnal mechanical ventilation for chronic hypoventilation in patients with neuromuscular and chest wall disorders. In: *Cochrane Database Syst Rev* 2001;(3):CD001941.
- 27 Nevitt MC, Cummings SR, Kidd S, Black D. Risk factors for recurrent nonsyncopal falls. A prospective study. *JAMA* 1989;261:2663-8.
- 28 Gillespie LD, Gillespie WJ, Robertson MC, Lamb SE, Cumming R, Rowe BH. Interventions for preventing falls in elderly people. *Cochrane Database Syst Rev* 2001;(3):CD000340.
- 29 Tinetti ME, Baker DI, McAvay G, Claus EB, Garrett P, Gottschalk, et al. A multifactorial intervention to reduce the risk of falling among elderly people living in the community. *N Engl J Med* 1994;331:821-7.
- 30 Gardner MM, Robertson MC, Campbell AJ. Exercise in preventing falls and fall related injuries in older people: a review of randomised controlled trials. *Br J Sports Med* 2000;34:7-17.
- 31 Gardner NN, Buchner DM, Robertson NC, Campbell AJ. Practical implementation of an exercise based fall prevention programme. *Age Ageing* 2001;30:77-83.